

Vertex Form of Quadratic Relations

4.1 p 196-203

State the vertex, axis of symmetry, direction of opening, domain, range and maximum of the quadratic relation

$$f(x) = -3(x+2)^2 + 5$$



Mar 25-12:47 PM

$$f(x) = a(x-h)^2 + k$$

$$f(x) = -3(x+2)^2 + 5$$

$$(h, k) \rightarrow (-2, 5)$$

-ve a \rightarrow opens down

Max $\rightarrow +5$

axis of symmetry $\rightarrow x = -2$

$$D = \{x \in \mathbb{R}\}$$

$$R = \{f(x) \in \mathbb{R} \mid f(x) \leq 5\}$$

Mar 25-12:51 PM

Determine the equation of the quadratic relation in standard form with a vertex $(1, -2)$ and passing $(4, -8)$

$$y = a(x-h)^2 + k$$

$$-8 = a(4-1)^2 - 2$$

$$-8 = a(3)^2 - 2$$

$$-8 = a(9) - 2$$

$$-8 = 9a - 2$$

$$-8 + 2 = 9a$$

$$-6 = 9a$$

$$-\frac{6}{9} = a$$

$$-\frac{2}{3} = a$$

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$$y = -\frac{2}{3}(x-1)^2 - 2$$

$$y = -\frac{2}{3}[(x-1)(x-1)] - 2$$

$$y = -\frac{2}{3}[x^2 - 1x - 1x + 1] - 2$$

$$y = -\frac{2}{3}[x^2 - 2x + 1] - 2$$

$$y = -\frac{2}{3}x^2 + \frac{4}{3}x - \frac{2}{3} - 2$$

$$y = -\frac{2}{3}x^2 + \frac{4}{3}x - \frac{2}{3} - \frac{6}{3} \quad (-2 \Rightarrow -\frac{6}{3})$$

$$y = -\frac{2}{3}x^2 + \frac{4}{3}x - \frac{8}{3}$$

Mar 25-1:02 PM

p205 210

10. The path of a ball is modelled by the quadratic function $h(t) = -5(t-2)^2 + 23$, where height, $h(t)$, is in metres and time, t , is in seconds.

- What is the maximum height the ball reaches?
- When does it reach the maximum height?
- When will the ball reach a height of 18 m?

Path of a ball

$$h(t) = -5(t-2)^2 + 23$$

Max Height

a) (h, k) The ball reaches a max height of 23m
 $(2, 23)$

b) It reaches its max height at 2s

Mar 25-1:09 PM

p205 210

$$h(t) = -5(t-2)^2 + 23$$

When at 18m

$$18 = -5(t-2)^2 + 23$$

Roots - Standard Form

$$18 = -5(t^2 - 4t + 4) + 23$$

$$18 = -5t^2 + 20t - 20 + 23$$

$$18 = -5t^2 + 20t + 3$$

$$0 = -5t^2 + 20t + 3 - 18$$

$$0 = -5t^2 + 20t - 15$$

$$0 = -5(t^2 - 4t + 3)$$

$$0 = -5(t^2 - 1t - 3t + 3)$$

$$0 = -5[t(t-1) - 3(t-1)]$$

$$0 = -5(t-3)(t-1)$$

The ball reaches 18m at 1s and 3s

Mar 25-1:12 PM

#6

6. The same quadratic function $f(x)$ can be expressed in three different forms:

$$f(x) = (x - 7)^2 - 25$$

$$f(x) = x^2 - 14x + 24$$

$$f(x) = (x - 12)(x - 2)$$

What information about the parabola does each form provide?

$f(x) = (x - 7)^2 - 25$ $(7, -25)$
 $f(x) = x^2 - 14x + 24$ at $t=0$ hint
 $f(x) = (x - 12)(x - 2)$ $5 \leftarrow$
 $+2 \quad +12$
 $a = \text{value all the same}$
 $\text{direction of the opening}$

Oct 19-10:37 AM

p 204 & 205

q. 4 (state max) 7, 8 ac,
9c,d, 12, 13, 14 & 16

hint #12 \Rightarrow a value

Mar 25-1:22 PM